GSFC
GN Mission Set and Loading Review
June 2003

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AGENDA

- Resource and Mission Model
- Modeling Assumptions
- Baseline Analysis Scenarios
- Network Utilization Forecast
- Additional Scenarios Studied
- Support Observations
- Recommendations
- Backup Material

Current GSFC GN Resources

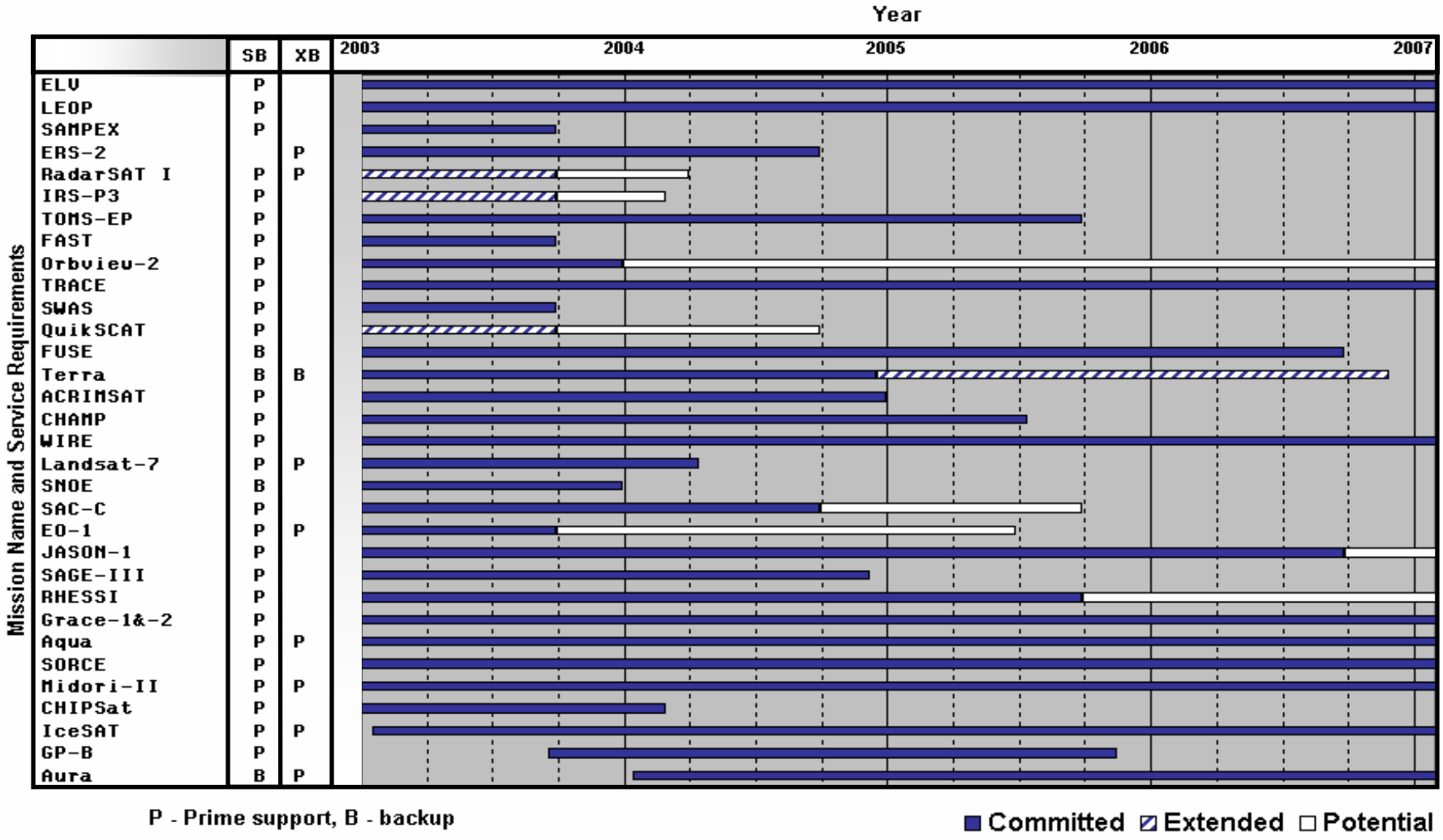
STATION	APERTURE (meters)	FREQUENCY (band)	PREPASS (minutes)	POSTPASS (minutes)
AGO	9/12 [1]	S	10	5
	7.5 [1]	S	10	5
AGS	11	X/S	8	10
	8 (TOTS)	S	10	5
	5 (LEO-T)	S	5	5
PF1	11	X/S	13	2
SGS	11	X/S	8	10
SKS	11	X/S	15 [4]	0
WGS	11	X/S	8	10
	9 [1, 2, 3]	S	20	5
	8 (TOTS)	S	10	5
	7.3 [3]	S/L	20	5
	5 (LEO-T)	S	5	5
MGS	10	X/S	15	5
MILA	9 [1, 2]	S	20	5

1. Antenna modeled only for specific LEOP support periods
2. Shuttle & launch support
3. Antenna has limited number of orbital customers
4. May shorten over time

GN X/S-band Resource Model

- One “fully capable” X/S-band system each at AGS & SGS
  - All required EOS support ground equipment with GSIF/GSIP operational
- Two additional commercial X/S-band systems (PF1 and SKS) with full capability with one exception:
  - Separate X-band recorder capabilities are not available for EO-1 at SKS
- Third commercial X/S-Band system (SG3) at Svalbard under going Aqua validation for possible backup/contingency support
- One “unenhanced” X/S-band system each at MGS and WGS with no special EOS ground support equipment
  - Aqua X-band science data can be captured at WGS if need be
- Antennas are 7x24 operation except:
  - MGS 5x11 operation with 5x18 on 24 hour advanced notice and other hours in automated tracking mode on “best efforts” basis (except full support is available for critical and emergency situations)

GN Mission Model (2002 through 2006)



Modeling Assumptions

- Visibilities are modeling with 5 degree circular station antenna masks (with exception of Aqua which uses 0 degree mask)
- Station passes are scheduled from "horizon-to-horizon"
  - Exception of Aqua hand-overs from SGS to AGS, or vice versa
  - Exception that FAST has maximum duration of 30 minutes
- Individual antenna utilization is nominally limited to 19 passes per day average for 10/11 meter antennas and 25 passes per day for smaller aperture antennas
- RFI is not a significant loading factor
  - Analyses to date indicate minimal interference that can be handled as an operational problem

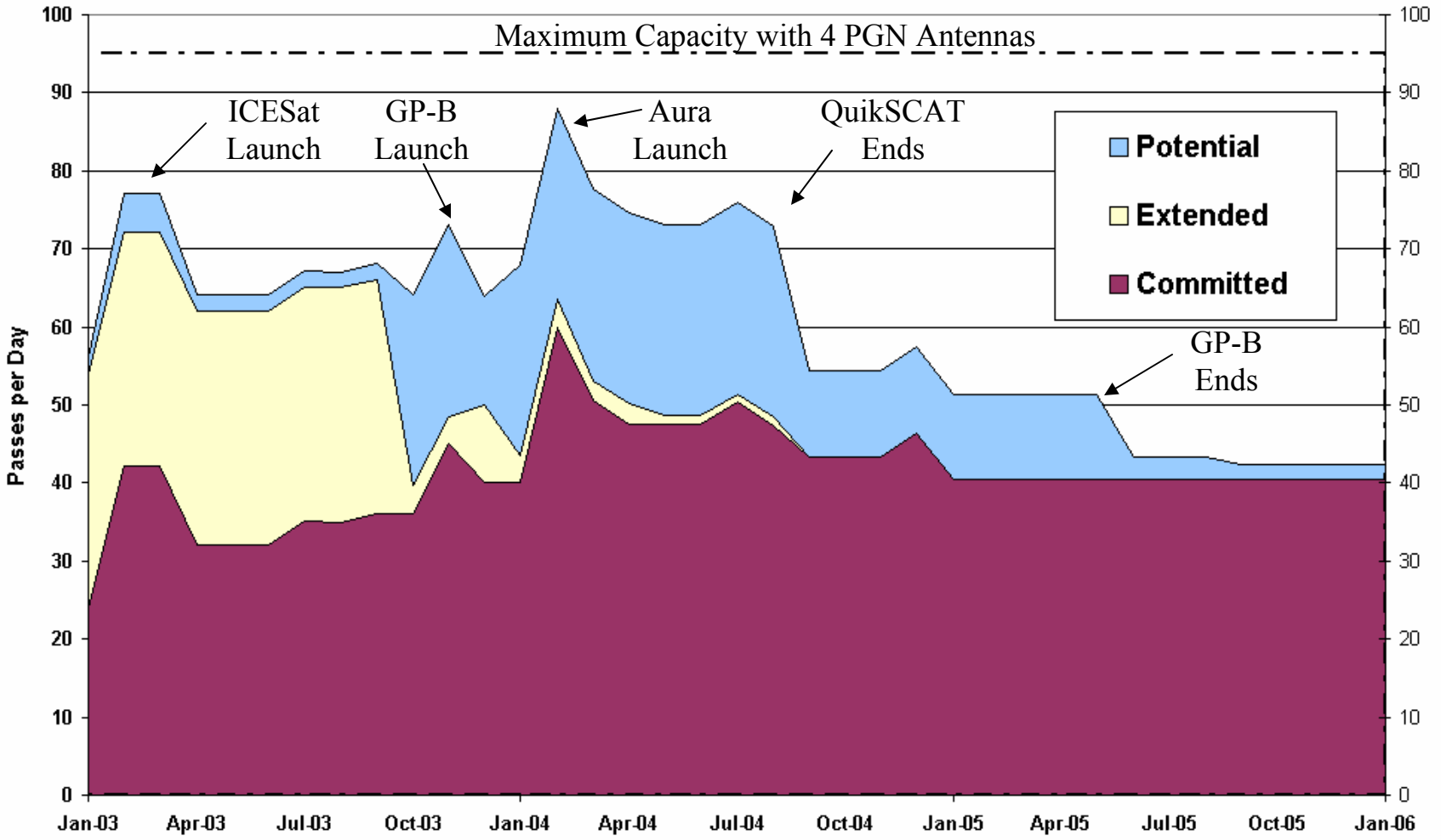
Modeling Assumptions (Continued)

- The Earth Science spacecraft maintain the orbital phasing required for their co-incident imaging
- LEOP support requirements for Aura are assumed to be same level as Aqua

GN Baseline Analysis Scenarios

- October 2003 (IceSAT and Aqua Nominal Operations including Aqua Hand-Over Passes)
- November 2003 (GP-B LEOP)
- December 2003 (GP–B Checkout/Activation)
- February 2004 (Aura LEOP/Checkout/Activation & ProSEDS LEOP)
- March 2004 (Aura Nominal Operations)

PGN 11 Meter Antenna Forecast Utilization



Additional Scenarios Studied

Risk Assessments:

- Prime antenna failures: Either AGS, SGS, PF1 or SKS
- Spacecraft emergency, for example, during Aura LEOP
- LEOP overlaps: GP-B with Aura
- Failure of prime PGN 11M aperture for Aqua or Aura support
- Terra prime on GN
- GP-B or Aura failure to reach nominal orbit (-2 or -3 sigma)

Support Observations

- Current X/S-band baseline GN antenna configuration is generally sufficient to support the current mission set during heaviest LEOP/Checkout periods
- Launch freeze and LEOP timeframes may cause loss of science data for spacecraft that are not certified at all four polar X-band apertures
- Adding 11 meter systems to TRACE and TOMS-EP scheduling resource pool increases support flexibility increasing probability of full science returns
- Extension of QuikSCAT into Aura timeframe will require SG3 validation and operational changes to meet continued high support levels as conflicts will occur during prime antenna ‘down’ times

Support Observations (Continued)

- In all antenna configurations, support impacts may arise in certain spacecraft emergency situations and antenna failures during heavy support periods
- NOAA 3 hour data latency requirements:
  - For baseline models, analysis indicates that over life of Aqua and Aura that requirements at Alaska and Norway will routinely be met. This includes ICESat data flow
  - Additional analysis with Terra support being prime on the GN indicates that for nominal support scenarios, the requirements at Alaska and Norway will be met

Recommendations

- Assure 3rd Svalbard antenna (SG3) validated and available for prime X-band polar resource customers in case of resource failures
  - If QuikSCAT continues to extend, may need additional polar X-/S-band resources for support
- Maintain close scrutiny of operational performance, particularly for overlapping LEOPs
- Emphasize requirements development earlier
  - Improve communication between MSP/CSOC and Projects
  - Require approved Detailed Mission Requirements Documents for mission peer reviews
    - Include detailed LEOP support requirements

Backup Material

- Modeling Approach
- GN Spacecraft Aperture Support Table
- GN Aperture Load Forecast
- Baseline Earth Science AM and PM Constellation Inter-Spacecraft Phasing Model

Modeling Approach

- Take network resource and mission models and translate requirements into generic support
- Define critical time periods, build appropriate baseline models, and generate spacecraft coverage appropriate for each
- Modeling tools use geometric calculations and simulated scheduling methods to quantify network loading. Impacts are identified by inability of individual spacecraft to receive support based on expected scheduling priority
- Examine and resolve conflicts as a result of possible orbital phasing
- Assess risk situations in baseline scenarios, build appropriate variant models, and identify possible impacts

GN Spacecraft Aperture Support Table

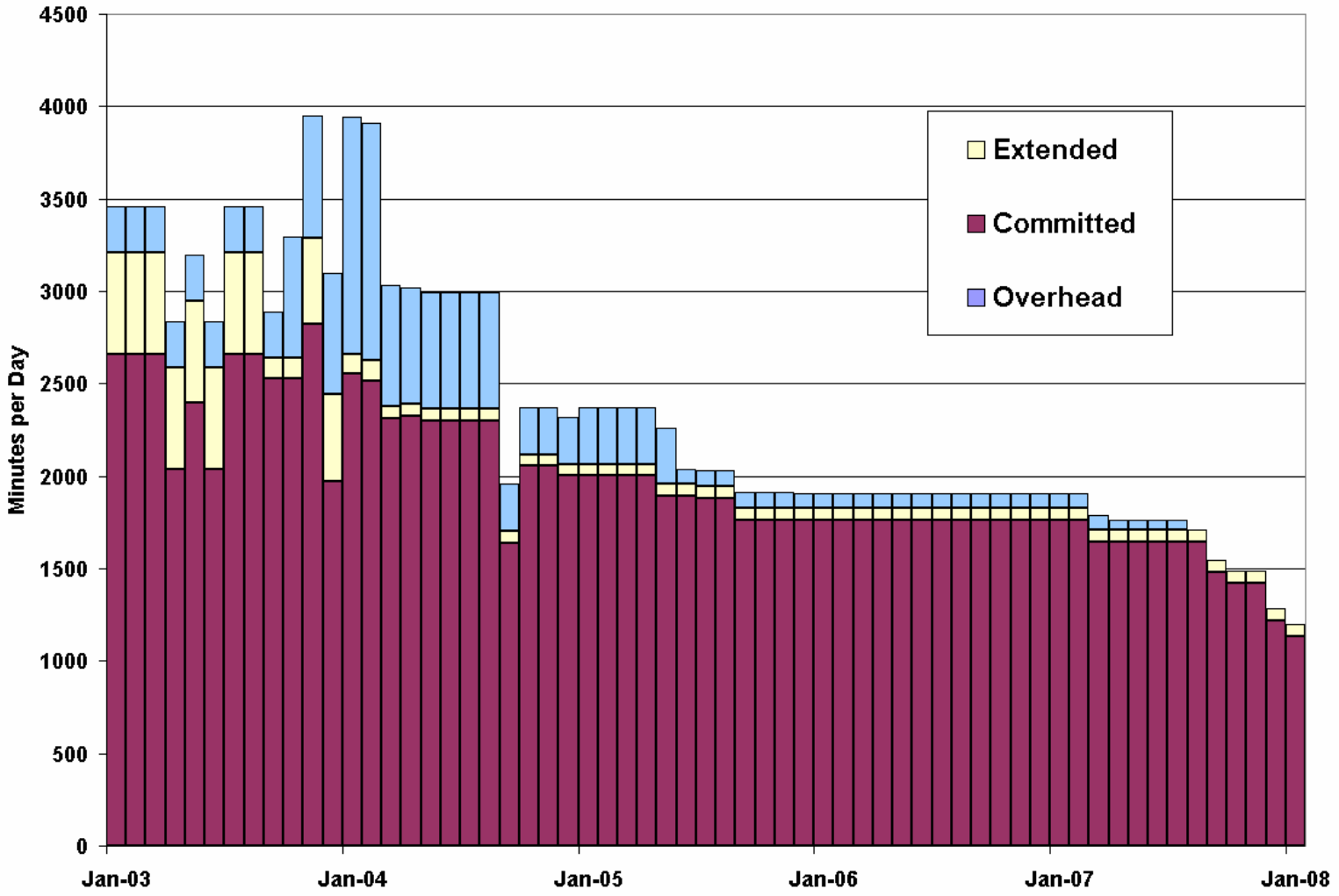
Mission	AGS 11M	PF1 11M	AGS 8M	AGS 5M	SGS 11M	SKS 11M	MGS 10M	WGS 11M	WGS 8M	WGS 5M	WGS 9M
ACRIMSAT	P				P			P			
ADEOS-II								P			
Aqua	P	P			P	P		S			
Aura	P	P			P	P		C			
CHIPSat											P
COBE							P	C			P
ENVISAT-1	C							C			
EO-1	P	P			P	C	C	S			
ERS-2							P				
FAST			P	P			P		P	P	
FUSE										S	
GOES-7											C
GP-B	P				P		C	P			
GRACE-1/-2	S	S			P	S	P	P			
RHESSI								P		C	S
ICESat	P	P			P	P	C	C			
IRS-P3								S	P	P	S
JASON-1				P						P	
Landsat-5											C
Landsat-7	P	P			P	C	C	C			
SeaWIFS	C							P	P		
ProSEDS											P
QuikSCAT	P	P	C	C	P	P	S	P	C	C	C
RADARSAT			C				P		C		
SAC-C	S		C		S		S	S	C		
SAMPEX			P	P					P	P	
SNOE			P	P			C		P	P	
SORCE								P	C	S	
STS								C			P
SWAS			P	P					P	P	
TDRS-I											P
Terra *	P	P			P	P		C			
TOMS-EP	S		P				S	P	P		P
TRACE			P	P			P		P	P	
WIRE			P	P			C		P	P	

P = Primary site, normally used for science and engineering support.

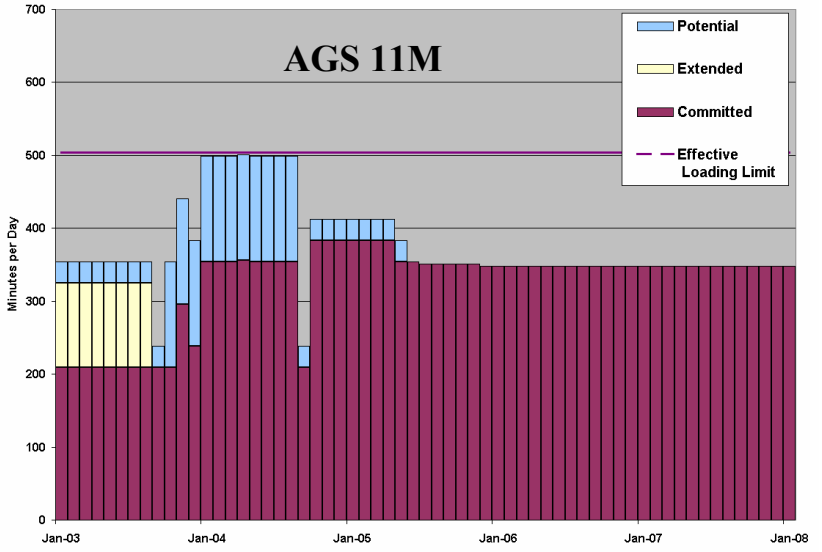
S = Secondary site, used for science and engineering support when Primary site is not available.

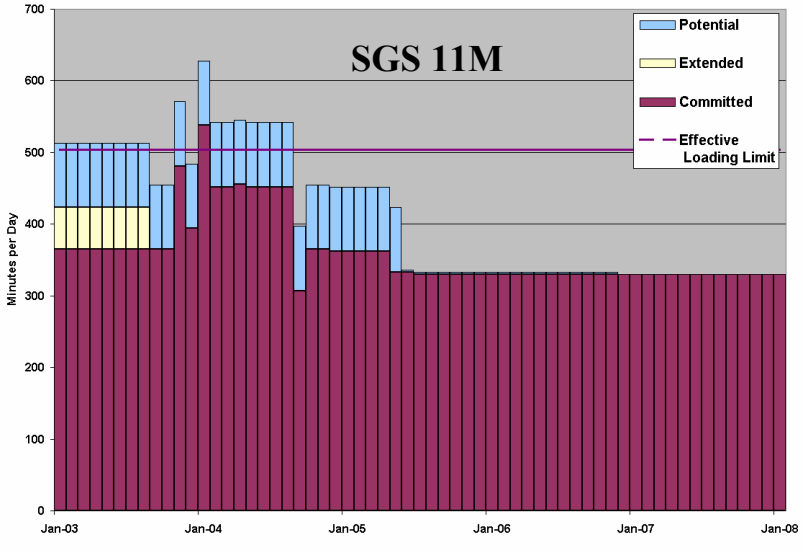
C = Contingency site, available for engineering support, science mission not supported.

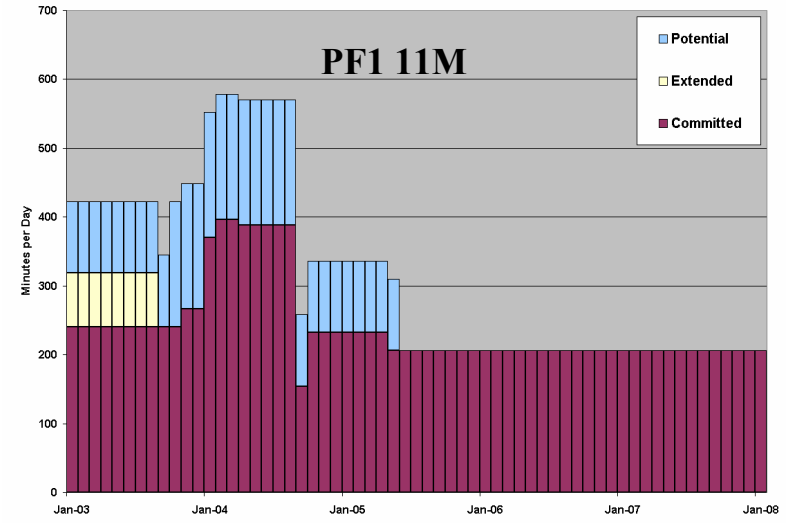
GN Network Load Forecast

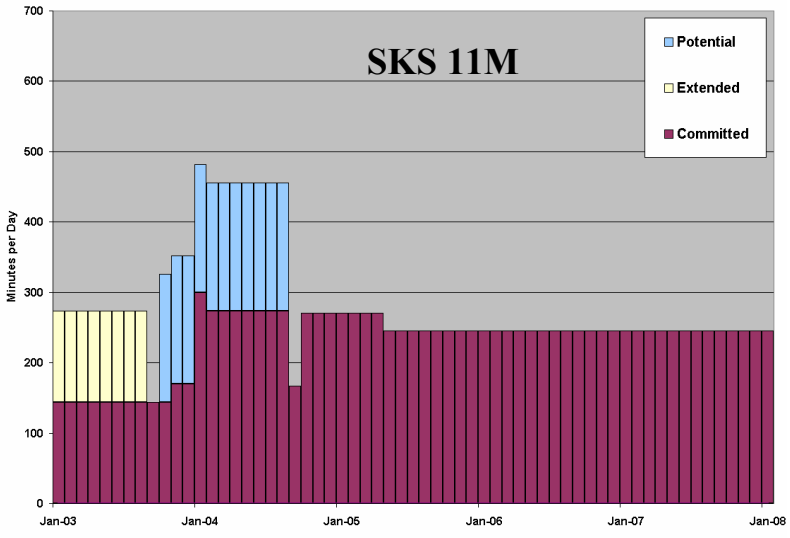


GN Aperture Load Forecast

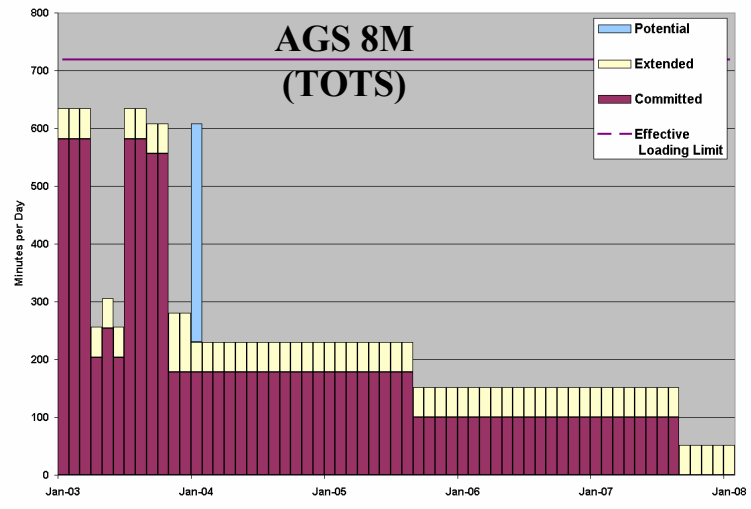


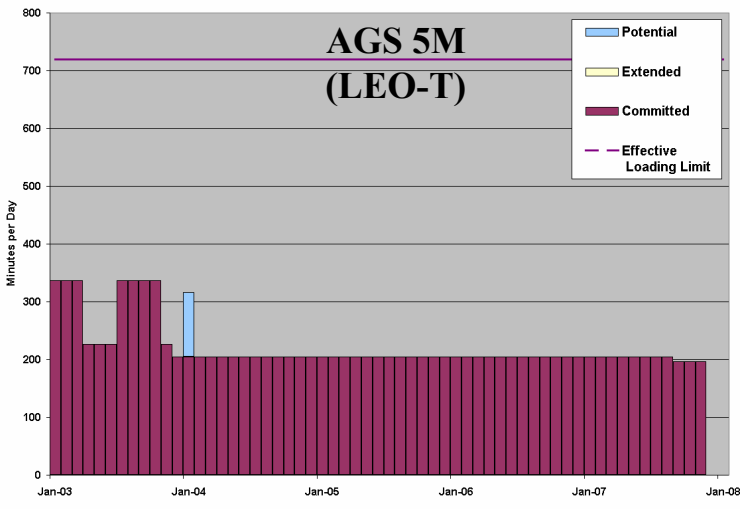


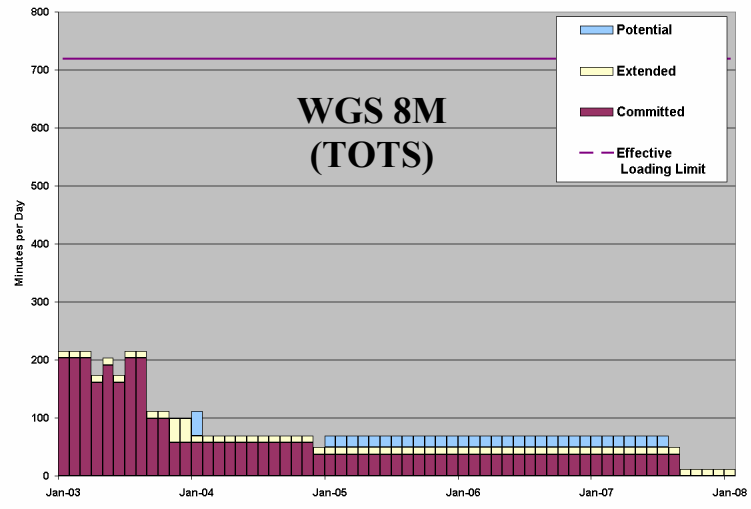


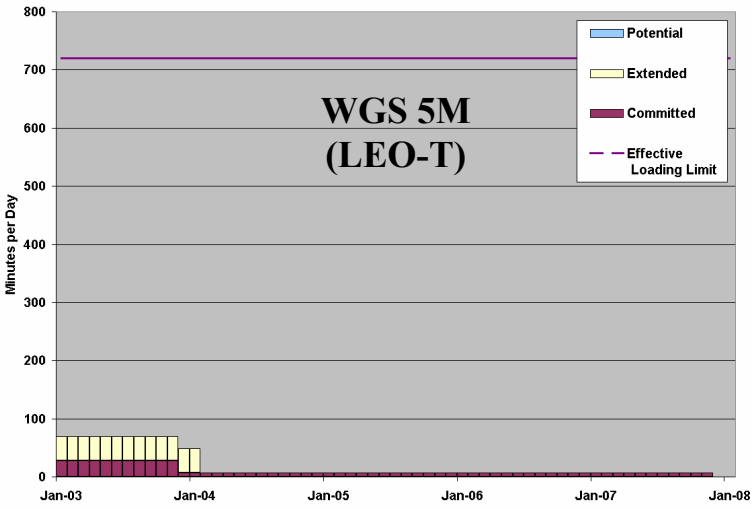


GN Aperture Load Forecast (Continued)

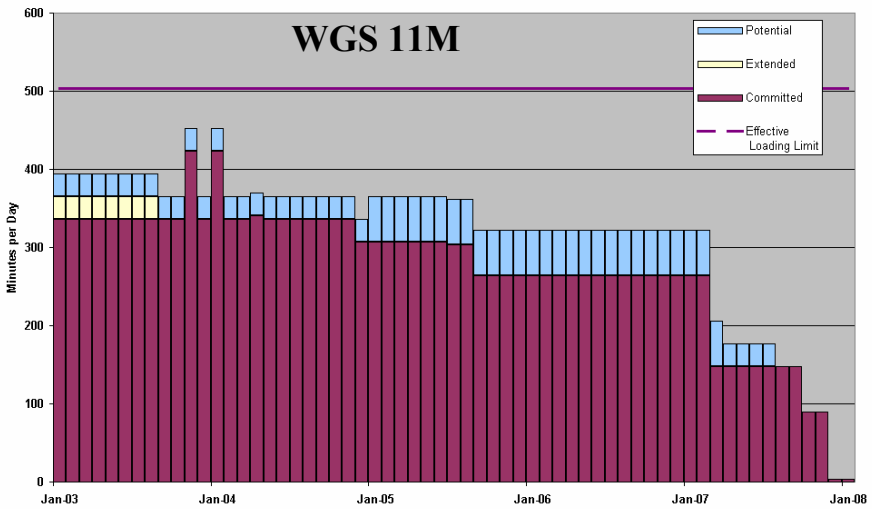


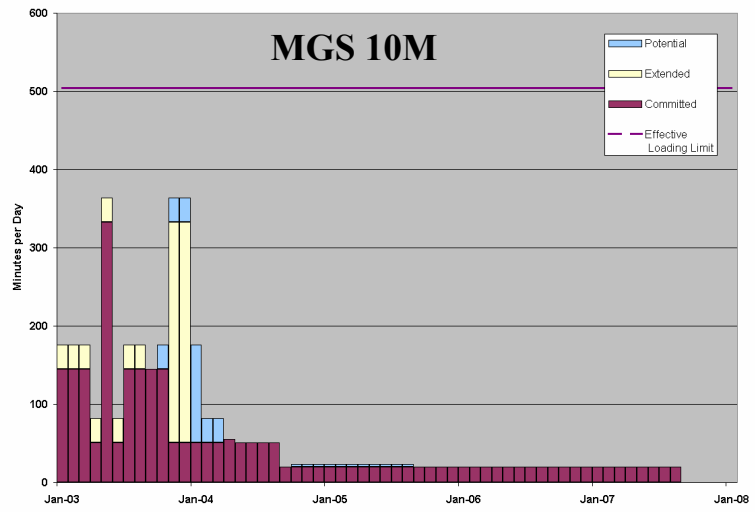




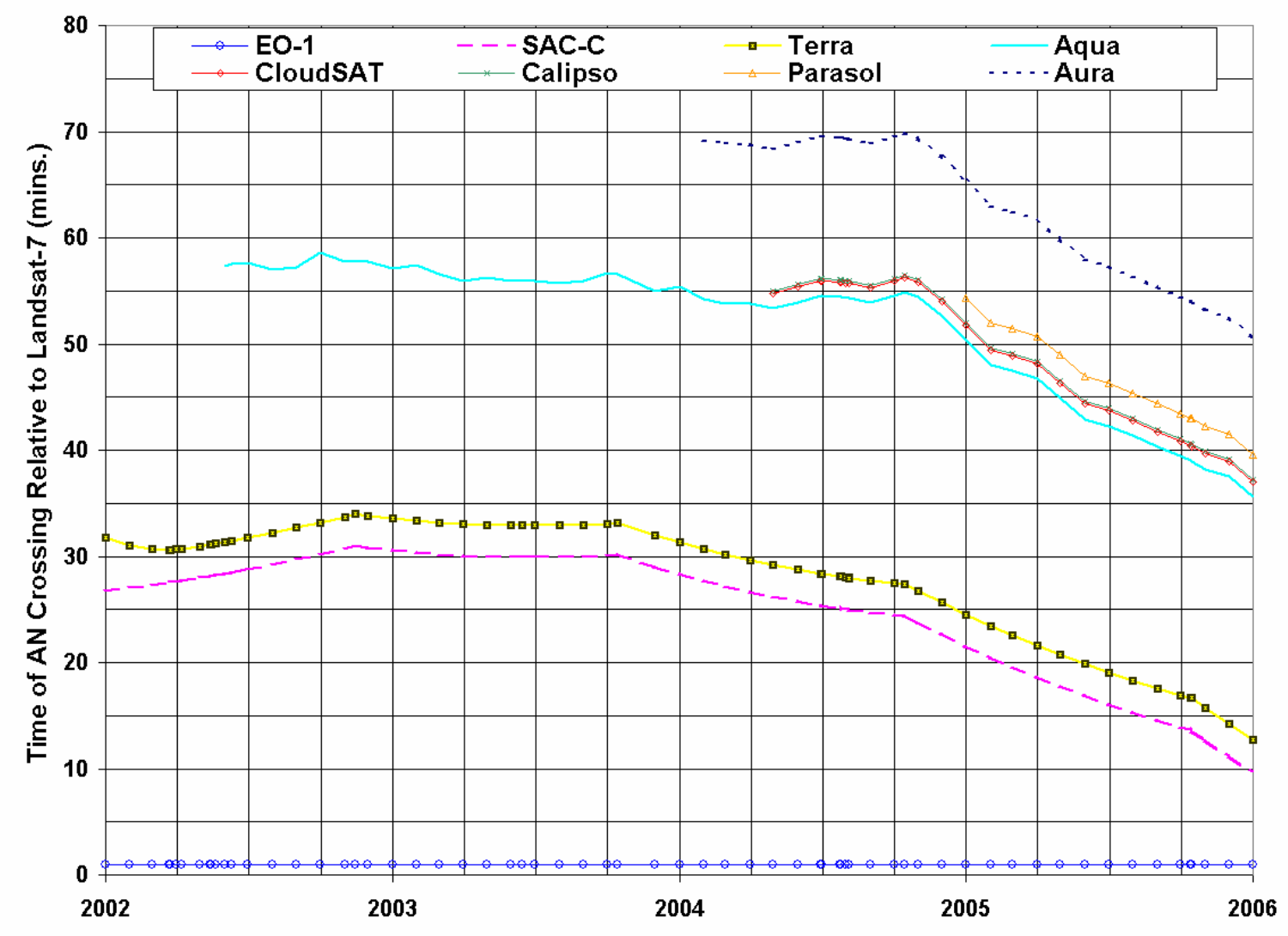


GN Aperture Load Forecast (Continued)





Baseline Earth Science AM and PM Constellation Inter-Spacecraft Phasing Model



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